



Technical Service Manual

SSPA-1 & SSPA-MP SPA PACKS SERVICE MANUAL

• by Gecko Electronics Inc. •

Visual step-by-step guide to easily
identify & correct technical problems!



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In an attempt to make this manual as useful as possible, it has been presented in two formats. Problem-solving solutions are described with Troubleshooting Flow Charts and also with Step-by-Step Procedures.

The two formats together should provide an overall complete explanation, with flow charts providing an overview of specific problems, and step-by-step procedures giving more detailed information.

Tools & Parts

Tools, test equipment and components needed to carry out SSPA power spa pack service calls.

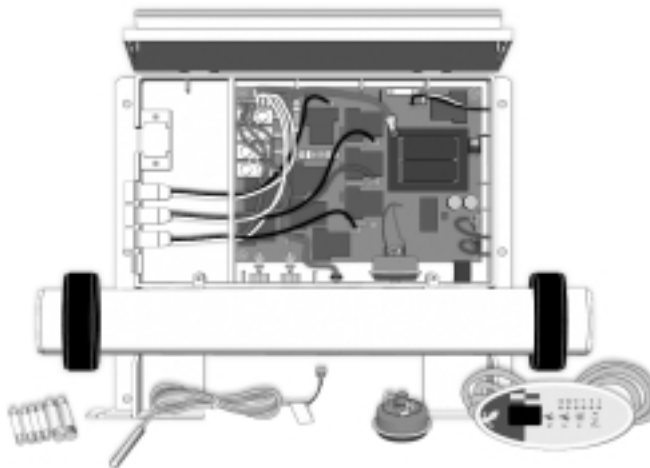
Required tools:



*Pliers
Phillips & flat screwdrivers
11/32" nut driver
1/4" open end wrench*

*3/8" open end wrench
Jumper cable
Multimeter
GFCI tester & digital thermometer (optional)*

Required pack parts:



*Fuses
Regulation sensor
SSPA complete pack*

*Pressure Switch
Top side control (keypad)*

Gecko Electronic Inc. sells Professional Repair Kits that include everything needed for SSPA power spa pack servicing. For more information, go to the last page of this manual.

Keypads

SSPA single- and dual-pump systems are available with a selection of keypads.

All the procedures and instructions described in the next pages are applicable to SSPA systems equipped with one of the following keypads. Please note that the TSC-9 model is used throughout this manual to illustrate specific actions.

SSPA-MP (only)



TSC-35 Keypad (7" • 3 1/4")

SSPA



TSC-19 Keypad (7" • 3 1/4")



TSC-18 Keypad (5" • 2 1/2")

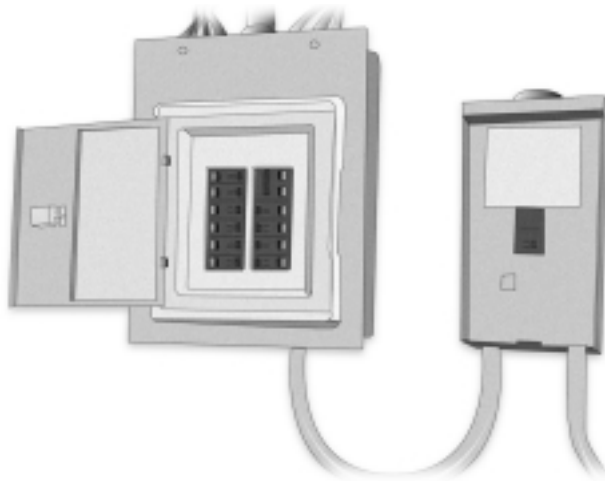


TSC-9 Keypad (2" • 4 1/2")

Electrical Wiring

Correct wiring of the electrical service box, GFCI box and pack terminal bloc is essential.

- 1• Carry out a visual inspection to check for signs of miswiring.
Refer to supplied wiring diagrams.
Call an electrician if necessary.



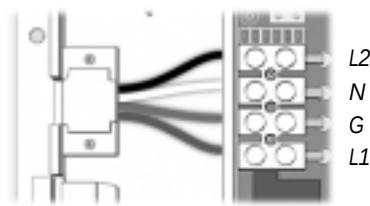
For 240 VAC systems:



Electrical Box

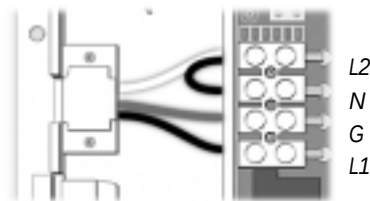


GFCI



Pack Terminal Block

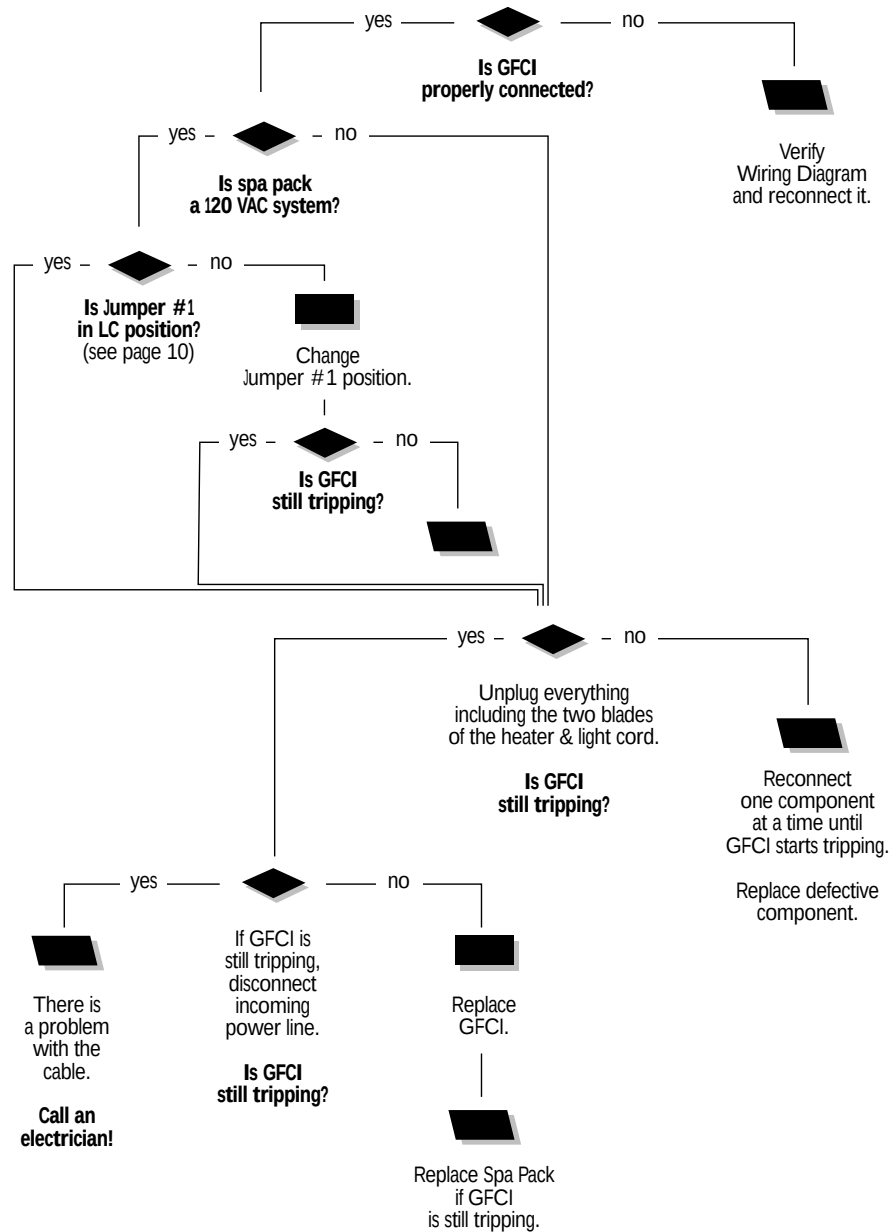
For 120 VAC systems:



Pack Terminal Block

GFCI Flow Chart

If GFCI trips, follow this Troubleshooting Flow Chart to identify the problem:



GFCI Trips!

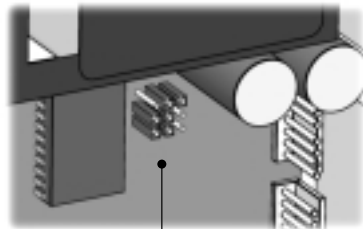
If all connections are made, but nothing seems to be working, you probably have a power supply problem. Carry out the following tests to identify and correct the problem:

Note that for new installations, GFCI trippings due to miswiring are common. If breaker is wired properly, GFCI trippings may occur when total amount of current drawn by spa exceeds breaker rating.

A current leak to ground will also cause GFCI to trip. If any of the components is faulty and a leak of more than 5mA occurs, GFCI will trip to prevent electrocution.

There are different GFCI models on the market. Note that illustrations are generic only.

For 120 VAC systems:



Jumper location

- 1• Verify if Jumper #1 is set in the LC position. If it is not, set Jumper #1 in the LC position.

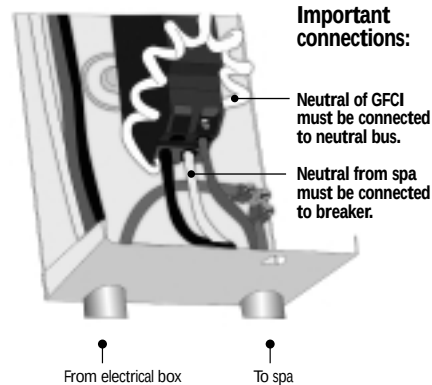
Refer to page 10 for more information on jumpers.

For 240 VAC systems:



From electrical box To spa

- 1• Verify if GFCI is properly connected.



Important connections:

Neutral of GFCI must be connected to neutral bus.

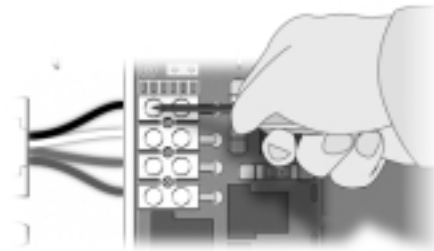
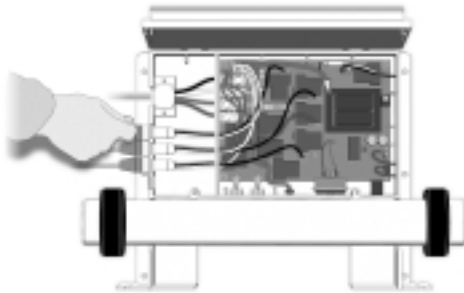
Neutral from spa must be connected to breaker.

From electrical box To spa

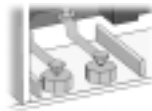
- 2• If it is not, verify GFCI wiring diagram and reconnect it.

GFCI Trips!

If GFCI continues to trip even after having replaced the transformer, carry out the following tests to correct the problem:



- 1• If GFCI is properly connected, but still tripping, (or Jumper #1 is set in LC mode for 120 VAC systems), unplug all outputs including the two blades of the heater and light cord.



- 2• If GFCI still trips, replace Spa Pack.
If it stops tripping, reconnect one component at a time until GFCI starts tripping. Replace defective component.

- 3• If problem is not solved yet, disconnect incoming power lines.

If GFCI still trips, there must be a cable problem.

Call an electrician!

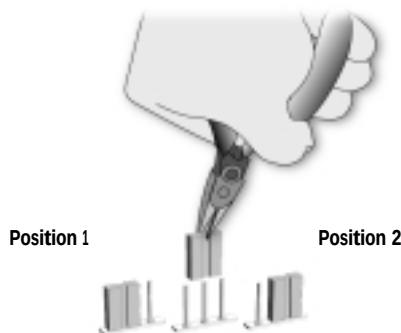
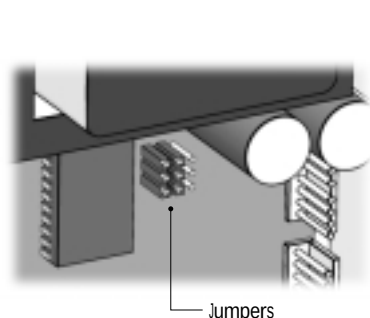
- 4• If GFCI stops tripping, replace GFCI.
- 5• If GFCI trips again, replace Spa Pack.

Jumper Positions

Certain SSPA spa pack parameters can be modified by changing the position of jumpers on the board.

To access jumpers, first remove SSPA power box cover.

In some cases, jumper functions may differ from the following. Please check wiring diagram on power pack box cover to verify specific functions for your pack.



1• Jumpers are located in the lower right section of the board.

2• To change a setting, simply pull cover off and replace in desired position.

Jumper 1: Current Limiting Option

Jumper 1 is used to limit amount of current drawn when the 2 pumps are on.

Position 1 (HC):

System turns heater off when the two pumps are on at high speed.

Position 2 (LC)*:

System turns heater on when one pump is on at high speed. The "Heater" icon flashes on display indicating that more heat is requested, but heater is not allowed to start.

*Mandatory for 120 VAC systems

Jumper 2: Temperature Unit

Jumper 2 is used to select the temperature unit.

Position 1:

Temperature will be displayed in Fahrenheit degrees.

Position 2:

Temperature will be displayed in Celsius degrees.

Jumper 3: Pumps

~~Position 1:~~

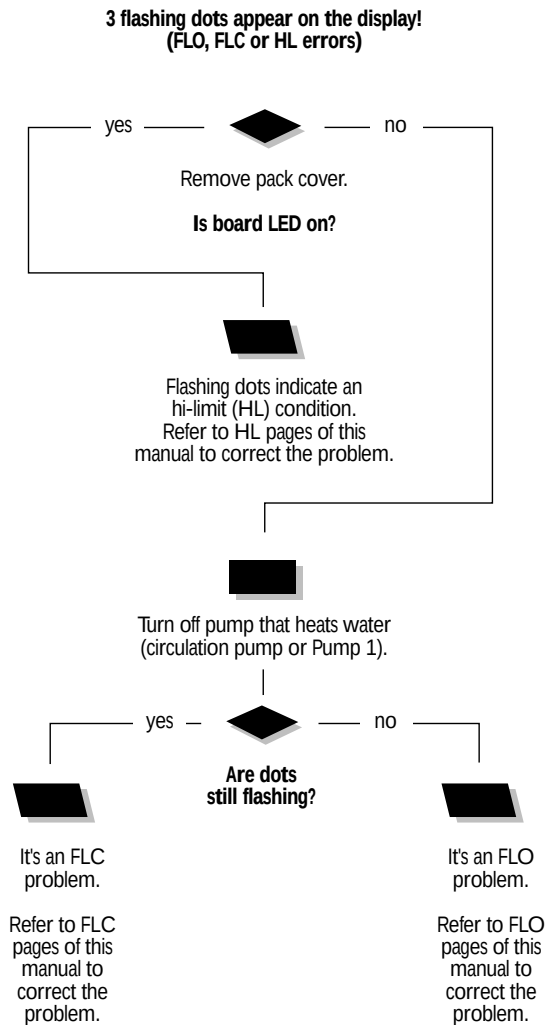
~~Single pump.~~

~~Position 2:~~

~~Dual pump (or blower).~~

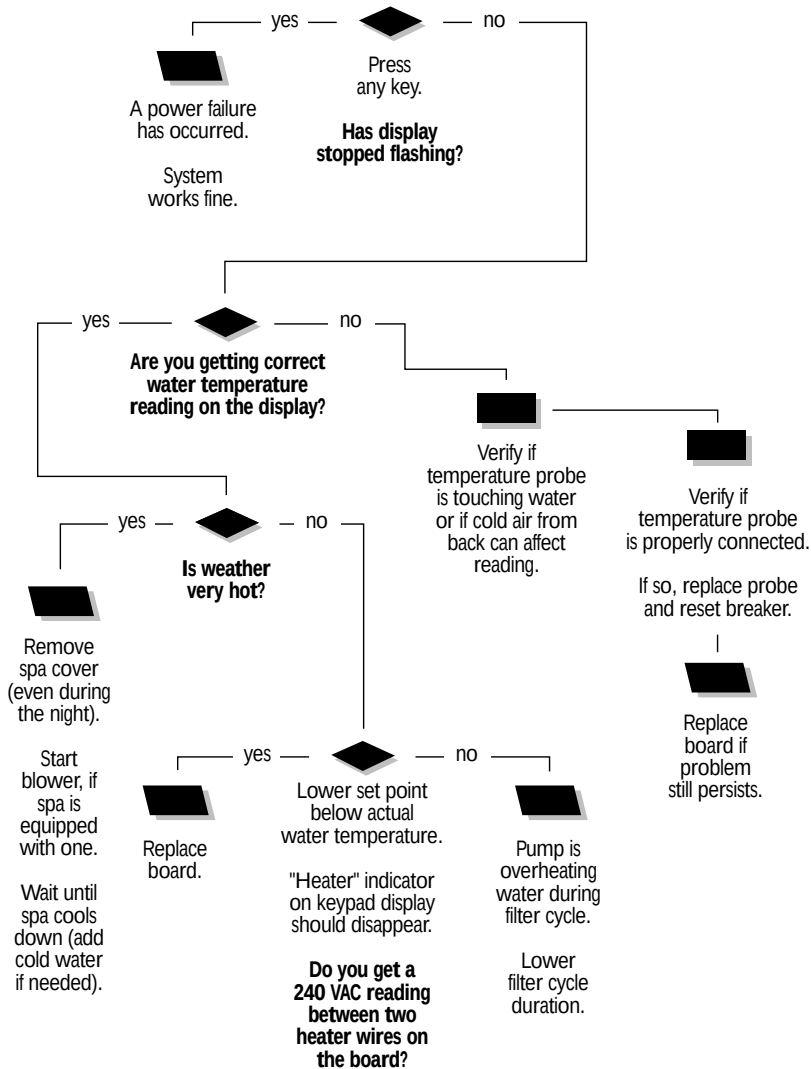
Flashing Dots Flow Chart

If 3 flashing dots appear on keypad display, follow Troubleshooting Flow Chart below to identify the problem:



Display Flashing Flow Chart

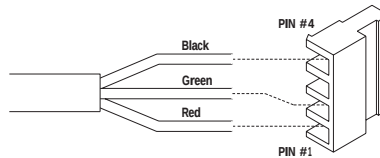
On SSPA-NE packs, if system detects temperature at 112°F or higher, the display will start flashing. Follow Troubleshooting Flow Chart below to identify the problem:



Wrong Temperature Flow Chart

On SSPA-NE packs, if system detects that temperature is not within normal limits, wrong temperature will be displayed. Follow Troubleshooting Flow Chart below to identify the problem:

Make sure to use the right probe!
MSPA-1 probe does not work on an SSPA spa pack.
Probe wires should be in this order:



Press any key after each step to reset the system.

Check if regulation probe is properly connected.

Unplug probe connector and clean pins on the board (even a small coating of film may cause a bad connection).
Reconnect the probe.

Replace probe with a spare and verify if problem is solved.

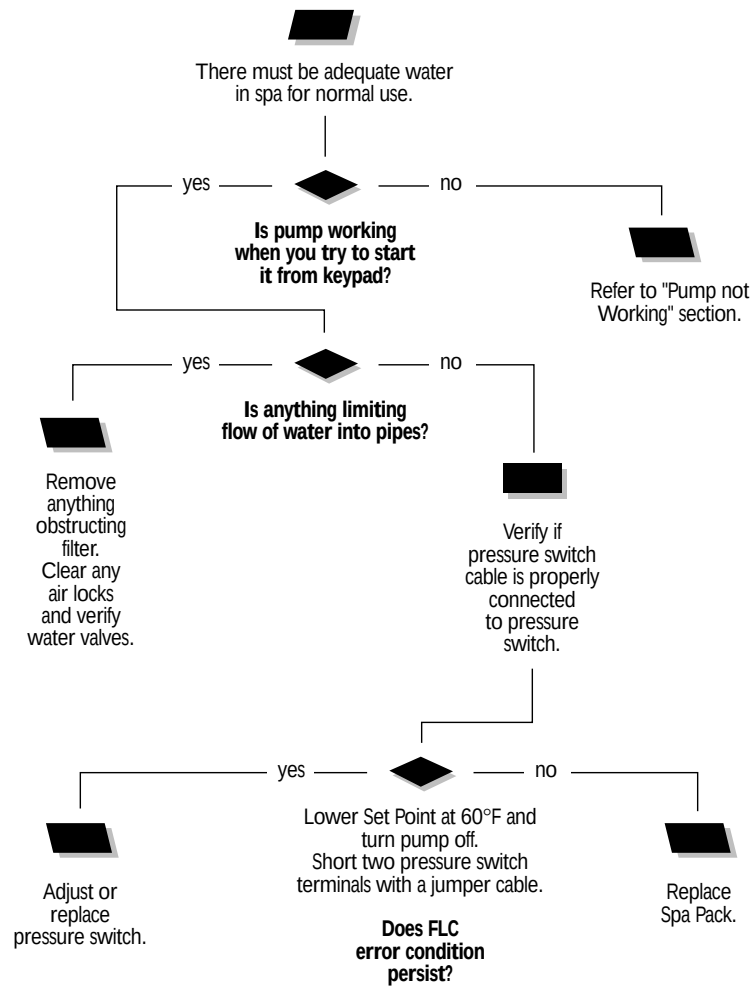
If it is, replace probe with spare.

Replace board if problem persists.

FLO Flow Chart

If FLO error condition occurs (problem with the pressure switch: pump is on but no water pressure detected), follow Troubleshooting Flow Chart below to identify the problem:

Make sure circulation pump parameter is set correctly (depending on your system configuration).



FLO Error Condition

An FLO error condition indicates a pressure switch problem. If system does not detect any pressure when pump is manually or automatically turned on, an FLO error condition will occur.

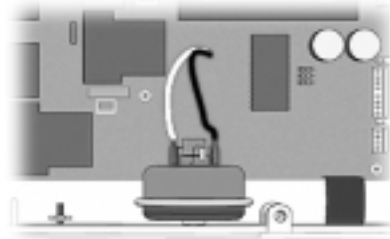
There must be enough water in the spa for normal operations. FLO error condition may occur if spa filter is dirty or if something restricts flow of water in piping.

The heater will automatically shut down when an FLO error condition occurs.

Power may remain On when the following steps are carried out.

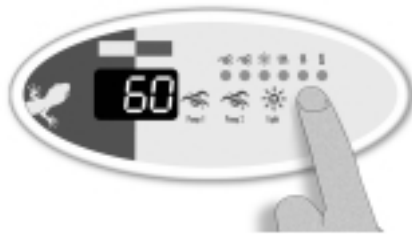
Make sure circ. pump parameter is set correctly (depending on your system configuration).

- 1• Verify if pump is working.
If pump is not working right,
refer to "Pump does not
Work" section.
- 2• Clean filter and check for air
blockages, closed trap valves
or anything that could be
restricting water flow.



- 3• Verify if pressure switch cable is
properly connected to pressure
switch.

FLO Error Condition



- 4• If problem has not been solved, lower Set Point at 60° by pressing on **Down** arrow key and turning pump off; then short two pressure switch terminals with jumper cable.

- 5• An FLC error condition should occur.

FLC error condition identifies pressure switch as source of problem.

Try readjust pressure switch. If this isn't possible, replace switch.

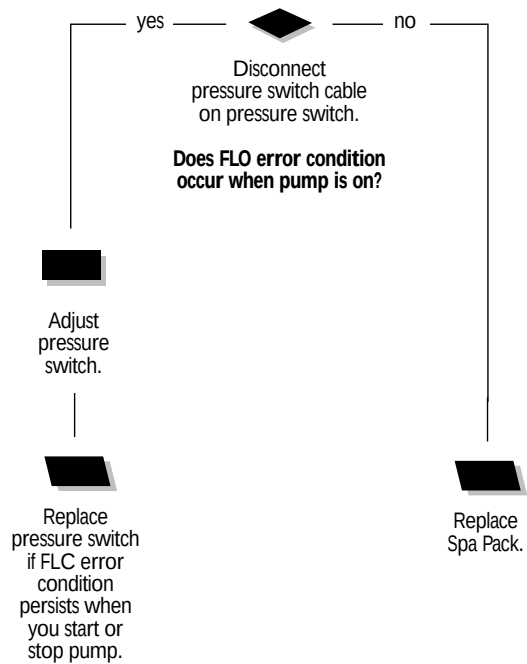
(Refer to "How to Adjust the Pressure Switch" section of this manual.)

- 6• If FLC error condition does not occur, problem may be either with switch cable or board.

Replace Spa Pack.

FLC Flow Chart

If FLC error condition occurs, follow Troubleshooting Flow Chart below to identify problem (usually pressure switch problem - pump is off but water pressure is detected):



FLC Error Condition

An FLC error condition indicates a pressure switch problem. If system detects any pressure when pump is off, an FLC error condition will occur.

Power may remain On when the following steps are carried out.



- 1 • Disconnect pressure switch cable on pressure switch.

If FLO error condition occurs when pump is started, adjust pressure switch or replace it.

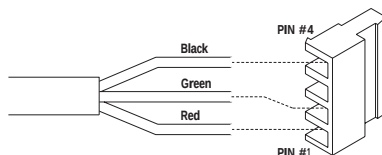
(Refer to "How to Adjust the Pressure Switch" section of this manual.)

- 2 • Replace Spa Pack if FLO error condition does not occur.

Prr Flow Chart

If Prr error condition occurs (potential regulation sensor problem), follow Troubleshooting Flow Chart below to identify the problem:

Make sure to use the right probe!
MSPA-1 probe does not work on an SSPA spa pack.
Probe wires should be in this order:



Press any key after each step to reset the system.

Note that water temperature must be over 35° F to operate spa.

Check if regulation probe is properly connected.

Unplug probe connector and clean pins on the board (even a small coating of film may cause a bad connection).
Reconnect the probe.

Replace probe with a spare and verify if problem is solved.

If it is, replace probe with spare.

Replace Spa Pack if problem persists.

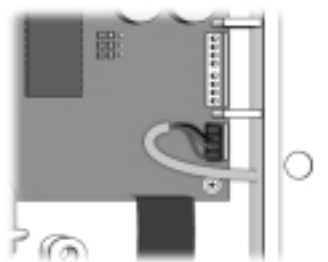
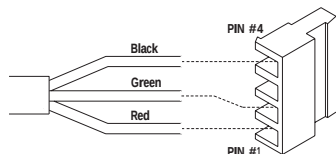
Prr Error Condition

The Prr error condition indicates a problem with regulation sensor. The system is constantly verifying if temperature probe reading is within normal limits.

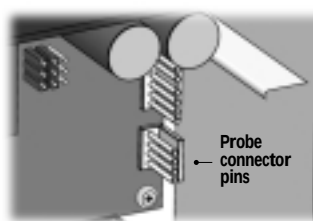
Note that water temperature must be over 35°F in order to carry out the following steps. Press any key after each step to reset the system. Power may remain On.

Note: Make sure to use the right probe! MSPA-1 probe does not work on a SSPA spa pack.

Probe wires should be in this order:



- 1• Verify if regulation probe is properly connected.



- 2• Disconnect probe connector and clean probe connector pins. Even a small coating of film may cause a bad connection.

- 3• Reconnect probe.

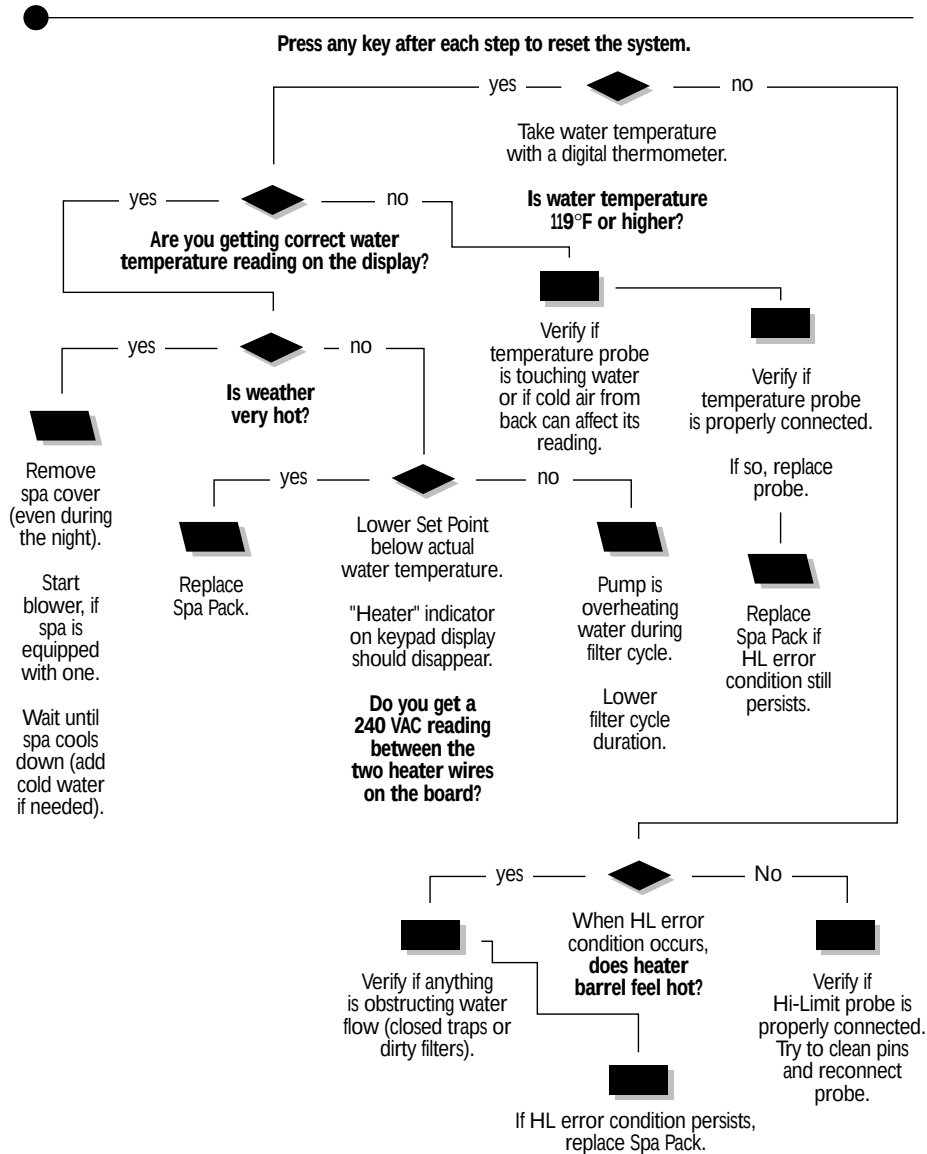
If Prr error condition still persists, replace probe with a spare and place probe head directly in spa water.

If problem is solved, replace probe.

- 4• Replace Spa Pack if problem persists.

HL Flow Chart

If HL error condition occurs (potential hi-limit probe problem), follow Troubleshooting Flow Chart below to identify the problem:



HL Error Condition

The HL error condition is related to the Hi-Limit sensor.

Steady message: Means system has shut down heater because water temperature at the heater has reached 119°F

Blinking message: Means except for the Smart Winter Mode, system has shut down because water temp. in the spa has reached 112°F

**Press any key between each step to reset the system.
Power may remain On.**

- 1 • Take water temperature with digital thermometer.

- 2 • **If reading is below 119°F:**

- a- Check if heater barrel feels hot.

If it's hot, verify if anything is obstructing water flow (closed valves or dirty filter).

- b- If HL error condition persists, replace Spa Pack.

- 3 • **If reading is 119°F or higher:**

Proceed to following page if keypad display shows correct temperature.

Proceed to page 22 if keypad doesn't show correct temperature.

HL Error Condition

If digital thermometer water temperature reading is 119°F or higher and keypad display indicates correct temperature, carry out the following tests.

If weather is very hot:

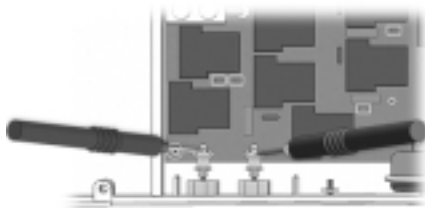
1. Remove spa cover (even during the night). Start blower if spa is equipped with one. Wait until spa cools down (add cold water if necessary).

If hot weather is not a factor:



2. Lower Set Point below current water temperature.

The "Heater" indicator should disappear from keypad display.

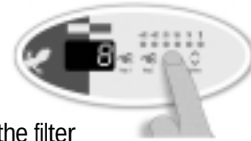


3. Remove plastic cover. With a voltmeter, read voltage between the two heater wires on the board.
4. **If you do not read 240 VAC,** pump may be overheating water during filter cycle.

Shorten filter cycle duration.

To shorten filter cycle duration:

5. Press and hold **Light** key for 5 seconds. Display will show a value that represents the filter cycle duration in hours.



Use **Down** arrow key to lower the number of hours.
0 = no filtration
12 = continuous filtration



When the desired setting is displayed, press **Light** key again. The filter cycle will start immediately.



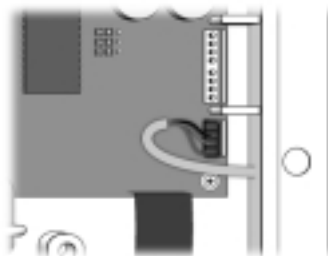
6. **If you do read 240 VAC,** replace Spa Pack.

HL Error Condition

If digital thermometer water temperature reading is 119°F or higher and keypad display isn't showing correct temperature, carry out the following tests.

- 1• Verify if temperature probe is in contact with water and if cold air from the back could be affecting readings.

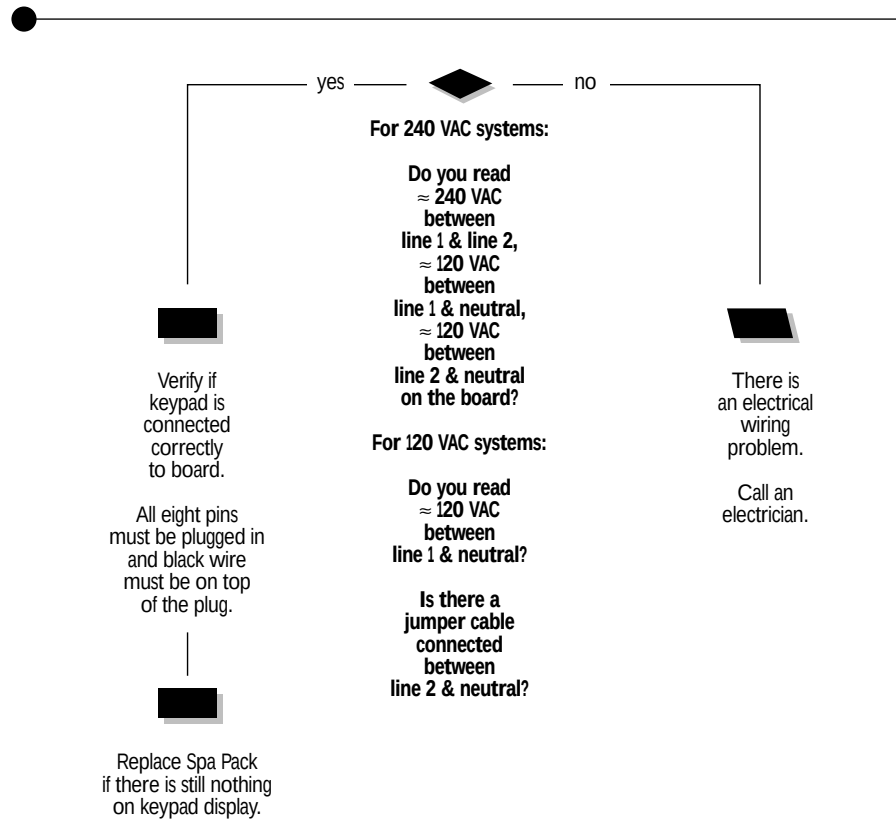
Use foam to isolate probe from cold air if that is the problem.



- 2• Make sure temperature probe is properly connected.
If it is, replace probe.
- 3• Replace Spa Pack if HL error condition still persists.

"Nothing Seems to Work!" Flow Chart

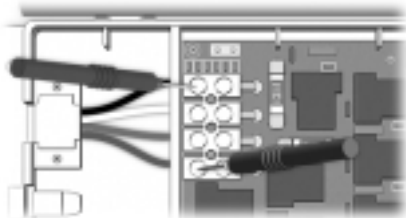
If nothing seems to work, follow Troubleshooting Flow Chart below to identify the problem:



Nothing Works!

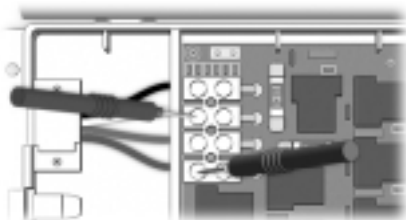
If everything is connected, but nothing seems to work, there is probably a power supply problem. Carry out the following tests to identify and correct the problem:

For 240 VAC systems:



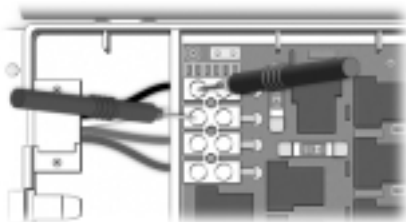
- 1• On the terminal block, measure voltage between line 1 and line 2.

You should get ≈ 240 VAC.



- 2• Measure voltage between line 1 and neutral.

You should get ≈ 120 VAC.



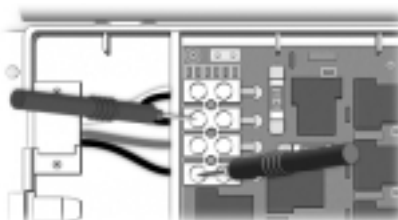
- 3• Measure voltage between line 2 and neutral.

You should get ≈ 120 VAC.

- 4• If you do not get good readings, this probably indicates an electrical wiring problem.

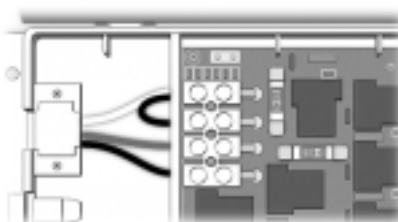
Call an electrician!

For 120 VAC systems:



- 1• Measure voltage between line 1 and neutral.

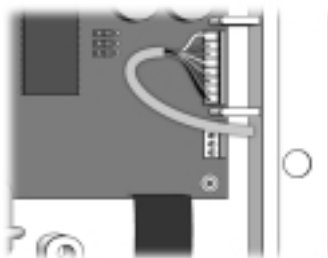
You should get ≈ 120 VAC.



- 2• Verify that there is a jumper cable connected between line 2 and neutral.

Nothing Works!

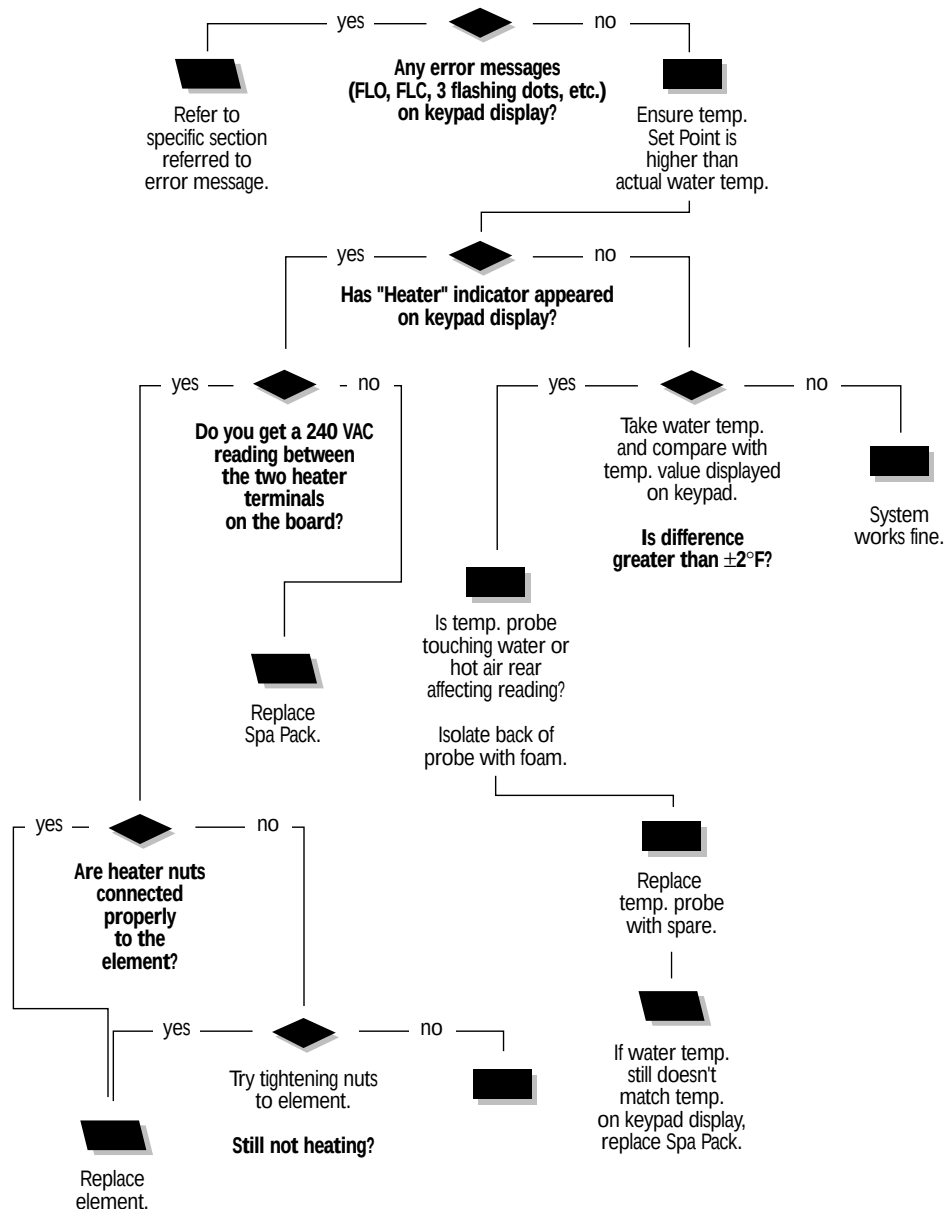
If you are getting good voltage readings, but nothing seems to work, carry out the following tests to correct the problem:



- 1• Verify if keypad is correctly connected to the board.
- 2• If nothing works, replace Spa Pack.

"Spa Not Heating" Flow Chart

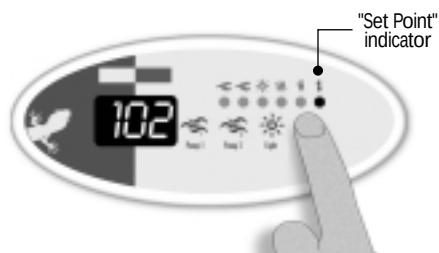
If the spa does not seem to be heating the water, follow Troubleshooting Flow Chart below to identify the problem:



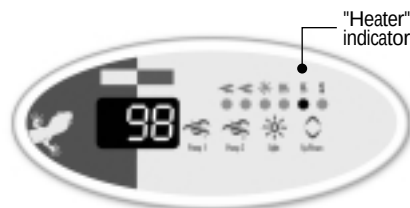
Spa Not Heating!

If the spa does not appear to be heating the water, carry out the following tests to correct the problem:

- 1• Check for an error message on keypad display. If there is one, refer to section indicated by the error message.



- 2• If there is no message, try to increase temperature by raising temperature Set Point. Press **Up** arrow key to increase Set Point.



- 3• Verify if "Heater" indicator appears on the display.

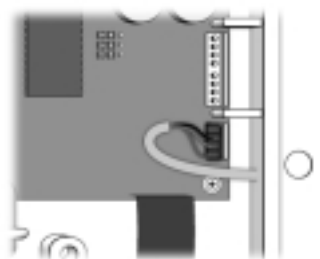
"Heater" indicator will be on when heater is on. It will flash if more heat has been requested, but heater has not yet started.

If "Heater" indicator does not light up:

- 4• Use a digital thermometer to take water temperature and compare your reading with the value on keypad display.

If values are different ($\pm 2^{\circ}\text{F}$), verify if sensor is touching water or if hot air from rear could be affecting readings.

- 5• If so, use foam to isolate behind the probe.

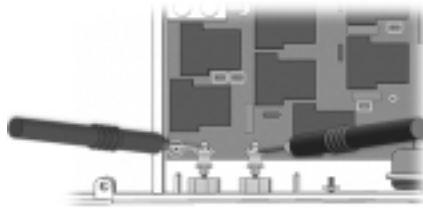


- 6• If not, replace temperature sensor with a spare one.
- 7• If spa is still not heating, replace Spa Pack.

Spa Not Heating!

If "Heater" indicator appears on the display, but spa is still not heating, carry out the following tests to correct the problem:

If "Heater" indicator lights up on the display:



- 1• Remove plastic cover and measure voltage between the two heater screws on the board.

Replace board if you are not getting a reading of ≈ 240 VAC.



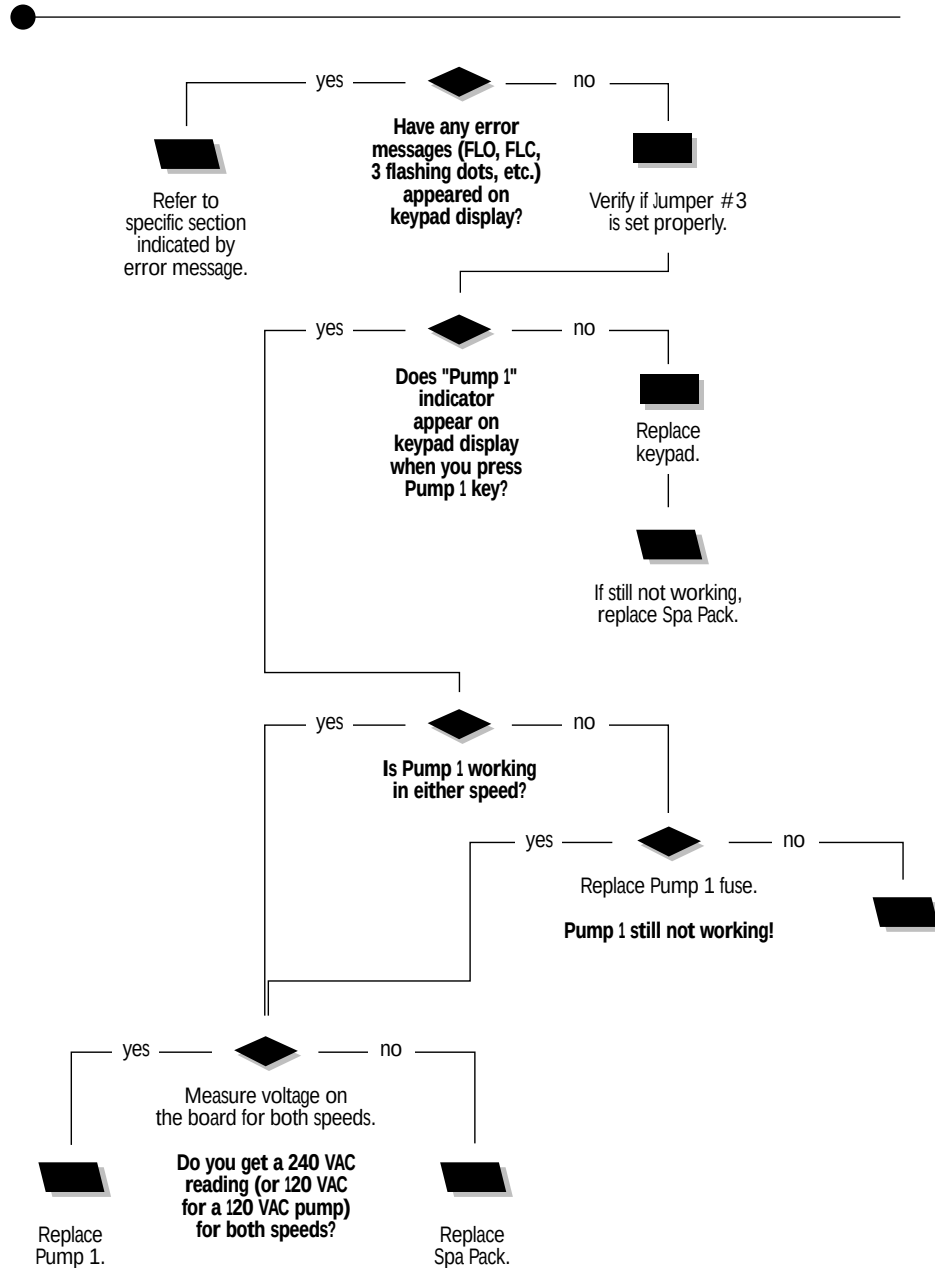
- 2• If voltage reading is correct, verify if heater nuts are properly connected to the element.

If not, tighten nuts to the element.

- 3• If problem persists, replace the element.

Pump 1 Flow Chart

If Pump 1 is not working, follow Troubleshooting Flow Chart below to identify the problem:



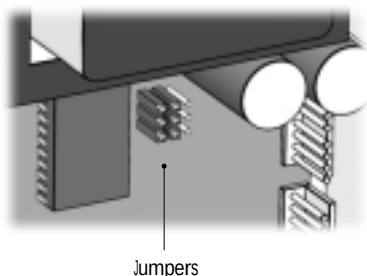
Pump 1 Does Not Work!

If Pump 1 is not working, carry out the following tests to correct the problem:

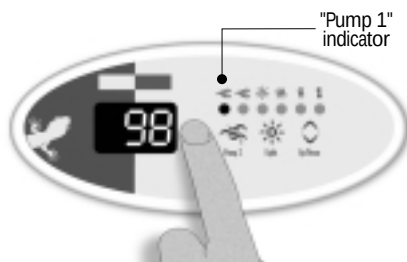
To increase the life of the relay, we use a "snubber" circuit on the pump relay. With this type of circuit, if no pump is connected to an output and relays are open, the voltmeter will continue reading around 60 volts. This is normal.

It is important to measure voltage when pump is connected to pack. Power must remain On.

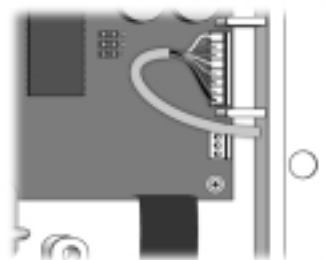
- 1• Check for an error message on keypad display. If there is one, refer to specific section indicated by error message.



- 2• Also, verify that Jumper #3 is set properly for 1 or 2 pumps (refer to page 10 for more info).



- 3• Verify if "Pump 1" indicator appears on keypad display when you press **Pump 1** key.



- 4• If "Pump 1" indicator does not appear, use a spare keypad to verify if keypad is defective.

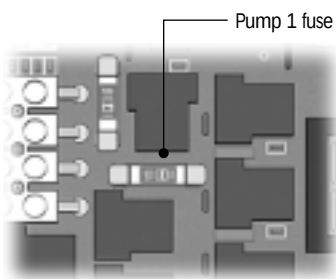
If it is, replace keypad.

If not, replace Spa Pack.

- 5• If "Pump 1" indicator appears when **Pump 1** key is pressed, verify if pump works in either speed.

Pump 1 Does Not Work!

If Pump 1 does not work in either speed, carry out the following tests to correct the problem:



- 1• If Pump 1 does not work in either speed, replace Pump 1 fuse.
- 2• If replacing the fuse is not effective or if Pump 1 works in only one speed, take voltage reading on the board for both speeds.



Turn Pump 1 to high speed and take voltage reading between white and red wire connectors:
240 VAC pump: P12 & P18
120 VAC pump: P7 & P12

Your reading should be:
≈240 VAC for a 240 VAC pump
≈120 VAC for a 120 VAC pump



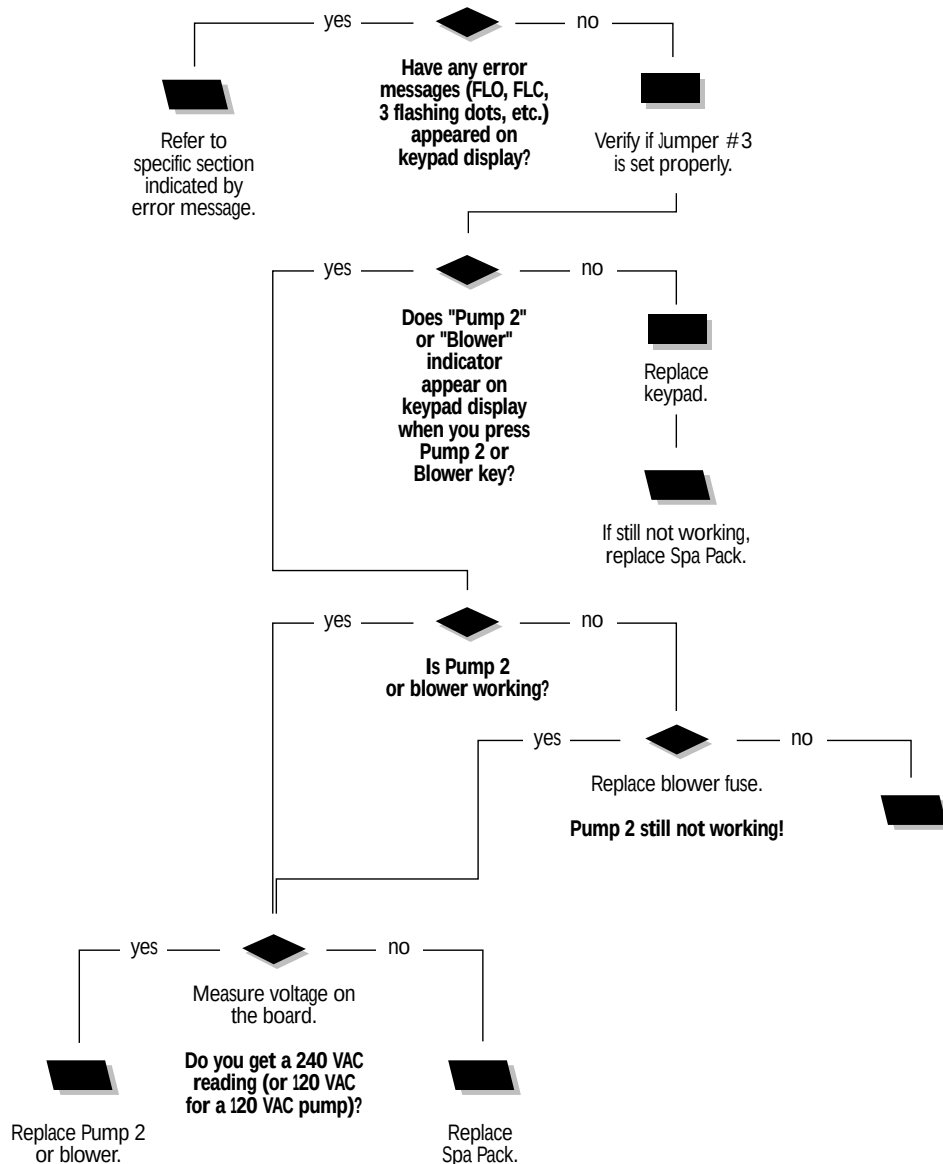
- 3• Turn Pump 1 to low speed and take voltage reading between white and black wire connectors:
240 VAC pump: P14 & P18
120 VAC pump: P7 & P14

Your reading should be:
≈240 VAC for a 240 VAC pump
≈120 VAC for a 120 VAC pump
- 4• If voltage is as it should be, replace Pump 1.
- 5• If not, replace Spa Pack.

Pump 2 or Blower Flow Chart

If Pump 2 or blower does not work, follow Troubleshooting Flow Chart below to identify the problem:

For SSPA Dual-Pump Systems only!



Pump 2 or Blower Does Not Work!

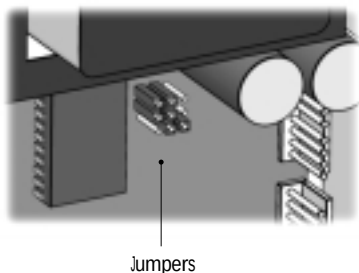
If Pump 2 or blower does not work, carry out the following tests to correct the problem:

For SSPA Dual-Pump Systems only!

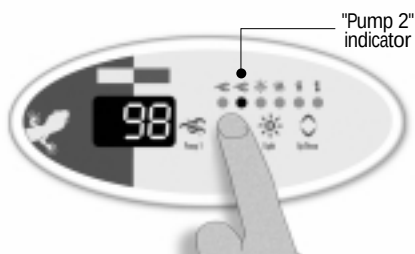
To increase the life of the relay, we use a "snubber" circuit on the pump relay. With this type of circuit, if no pump is connected to an output and relays are open, the voltmeter will continue reading around 60 volts. This is normal.

It is important to measure voltage when pump is connected to pack. Power must remain On.

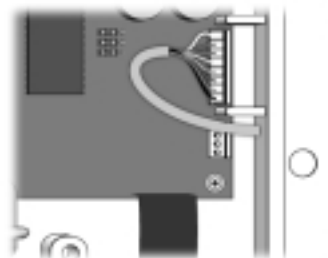
- 1• Check for an error message on keypad display. If there is one, refer to specific section indicated by error message.



- 2• Also, verify that Jumper #3 is set properly for 2 pumps (refer to page 10 for more info).



- 3• Verify if "Pump 2" or "Blower" indicator appears on keypad display when you press **Pump 2** or **Blower** key.



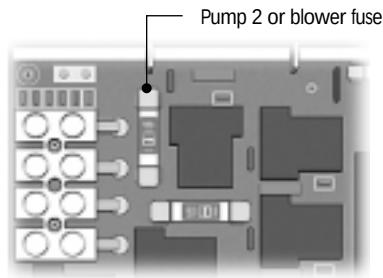
- 4• If "Pump 2" or "Blower" indicator does not appear, use a spare keypad to verify if keypad is defective.

If it is, replace keypad.

If not, replace Spa Pack.

Pump 2 or Blower Does Not Work!

If Pump 2 or blower does not work, carry out the following tests to correct the problem:

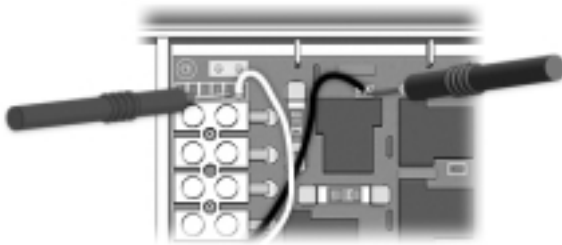


3• If voltage is as it should be, replace Pump 2 or blower.

4• If not, replace Spa Pack.

1• If Pump 2 or blower does not work even when indicator is on, replace Pump 2 or blower fuse.

2• If replacing the fuse is not effective, take voltage reading on the board.

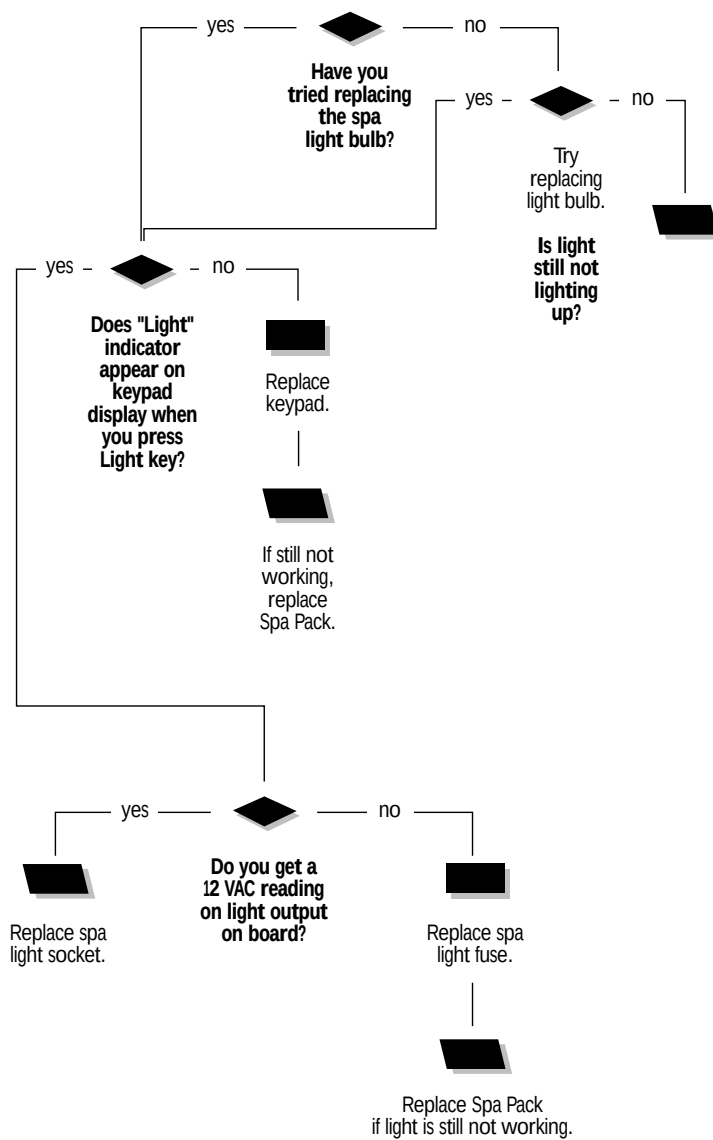


Turn Pump 2 or blower on and take voltage reading between white and black wire connectors:
240 VAC pump or blower: P11 & P17
120 VAC pump or blower: P9 & P11

Your reading should be:
≈240 VAC for a 240 VAC pump or blower
≈120 VAC for a 120 VAC pump or blower

Spa Light Flow Chart

If spa light does not appear to be working, follow Troubleshooting Flow Chart below to identify the problem:

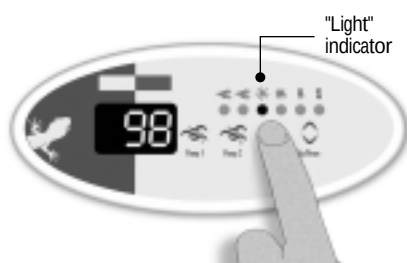


Spa Light Does Not Work!

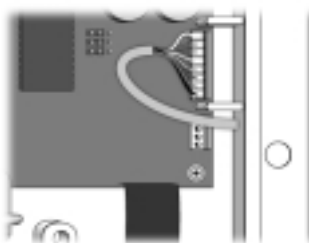
If spa light is not working, carry out the following tests to correct the problem:

**It is important to measure voltage when light is connected to pack.
Power must remain On.**

- 1• The first step is to replace the spa's light bulb.



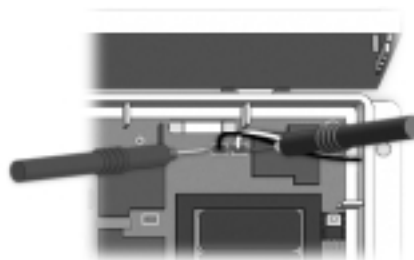
- 2• If light still isn't working, verify if "Light" indicator appears on keypad display when you press **Light** key.



- 3• If "Light" indicator doesn't appear, use a spare keypad to verify if spa keypad is defective.

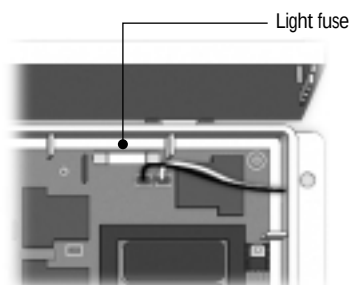
If it is, replace keypad.

If not, replace Spa Pack.



- 4• If "Light" indicator appears, but light still isn't working, remove plastic cover and measure voltage between two light wires on the board.

If you get ≈ 12 VAC, replace light socket.



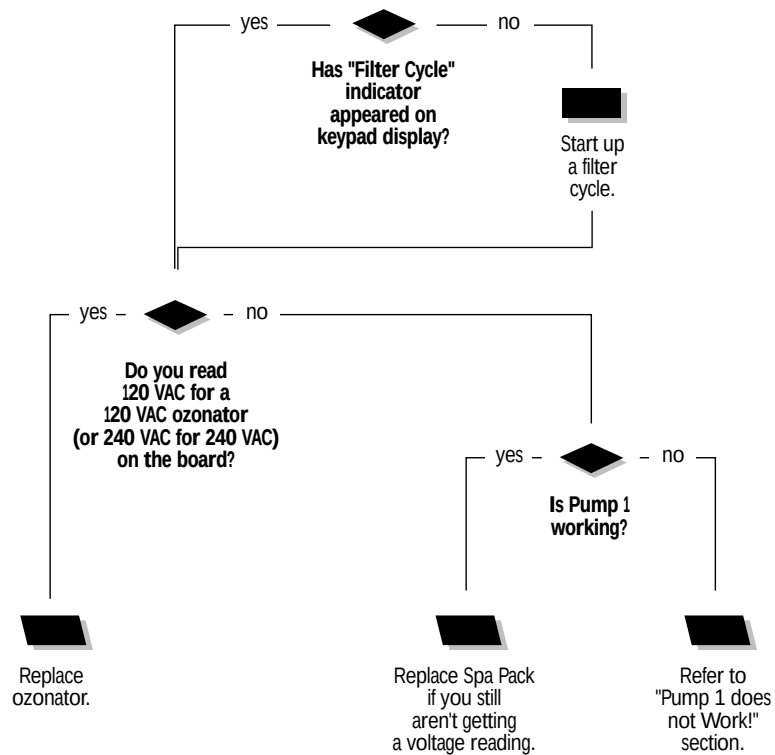
- 5• If you aren't getting a voltage reading, replace light fuse on the board.

- 6• If problem persists, replace Spa Pack.

Ozonator Flow Chart

If the ozonator is not working, follow Troubleshooting Flow Chart below to identify the problem:

Ozonator output will be shut down when
Pump 1, Pump 2 or blower have been turned on manually.



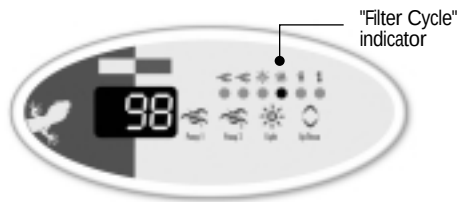
Ozonator Does Not Work!

If ozonator isn't working, carry out the following tests to correct the problem:

To increase the life of the relay, we use a "snubber" circuit on the ozonator relay. With this type of circuit, if no ozonator is connected to an output and relays are open, the voltmeter will still get a reading of around 60 volts. This is normal.

It is important to take voltage reading when ozonator is connected to pack. Power must remain On.

Please take note that ozonator output will be shut down when Pump 1, Pump 2 or blower have been turned on manually.



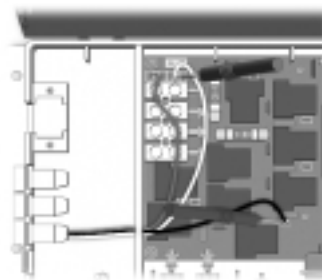
- 1• Verify if "Filter Cycle" indicator appears on keypad.

- 2• If not, start up a filter cycle.

Press and hold **Light** key for 5 seconds. The display will show a value that represents the filter cycle duration in hours.



Press **Light** key again. The filter cycle will start immediately.



- 3• Measure voltage between ozonator black and white connectors:
240 VAC ozonator: P16 & P19
120 VAC ozonator: P16 & P8

You should read ≈ 240 VAC (≈ 120 VAC for a 120 VAC ozonator).

- 4• Replace ozonator if you get a good voltage reading.

- 5• Check if Pump 1 is working.

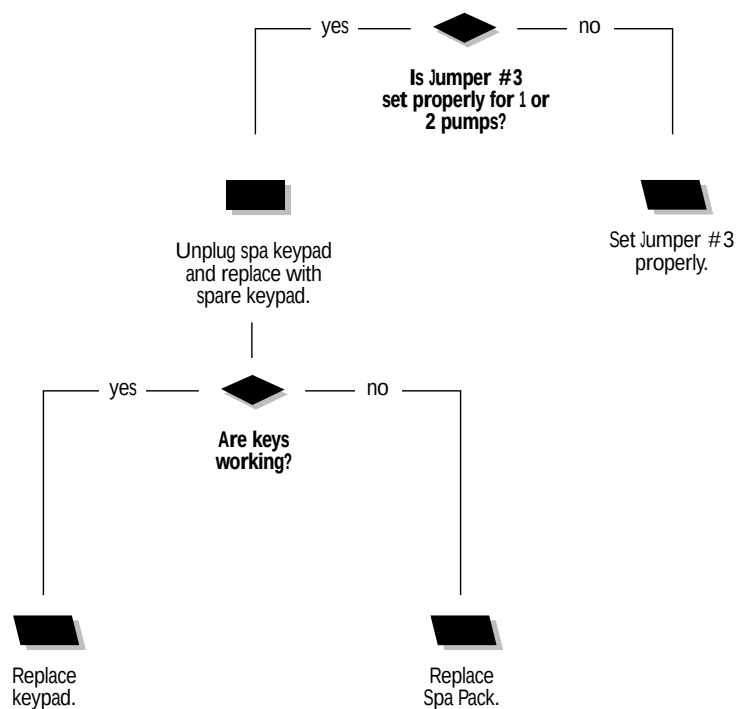
If so, replace Spa Pack.

If Pump 1 is not working, refer to "Pump 1 does not Work!" section.

Keys Flow Chart

If any of the keys on the keypad do not seem to be working, follow Troubleshooting Flow Chart below to identify the problem:

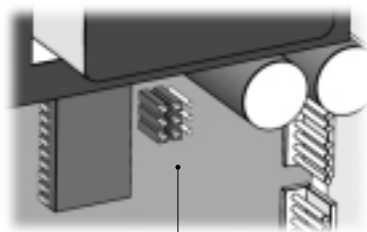
Make sure to use the proper keypad: TSC-35 keypad with SSPA-MP spa pack.
TSC-18, TSC-19 or TSC-9 keypad with SSPA-1 spa pack.
Also refer to Jumper Section (p. 10) to see if outputs are set correctly.



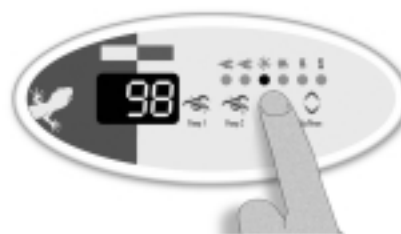
Keys Don't Work !

If any of the keys do not seem to be working, carry out the following tests to correct the problem:

Make sure to use the proper keypad: TSC-35 keypad works with a SSPA-MP spa pack. TSC-18, TSC-19 or TSC-9 keypad works with a SSPA-1 spa pack. Also refer to Jumper Section (p. 10) to see if outputs are set correctly.



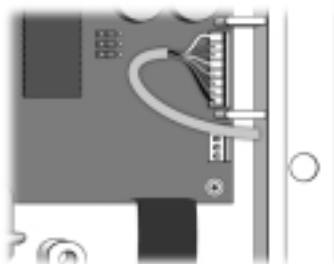
Jumpers



- 1• Verify that Jumper #3 is set properly for 1 or 2 pumps (refer to page 10 for more info.)

- 3• Verify if keys respond correctly.

- 4• If they do, replace keypad.



- 2• Replace spa keypad with a spare keypad.

- 5• If they do not respond, replace Spa Pack.

How To Replace The Spa Pack

When replacing an SSPA spa pack, it is important to make sure to turn power off before proceeding.



- 1 • Unplug Pump 1, Pump 2 (or blower) and ozonator connectors.



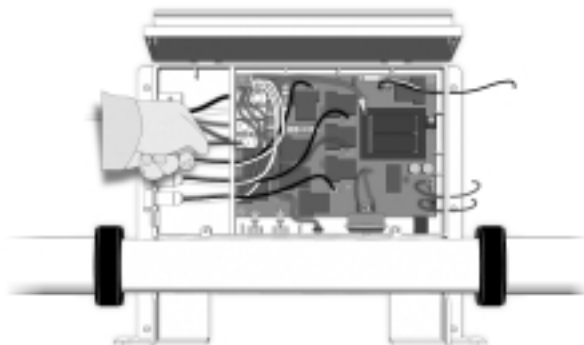
- 2 • Remove 2 screws from front pack cover.



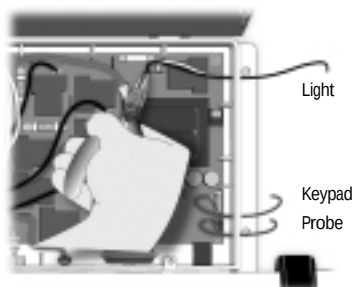
- 3 • Lift the Spa Pack cover.

How To Replace The Spa Pack

When replacing an SSPA spa pack, it is important to make sure to turn power off before proceeding.



- 4• Disconnect power input cables.



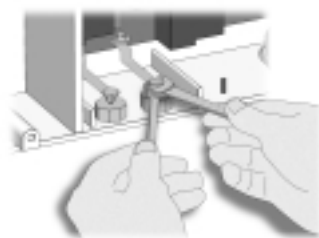
- 5• Disconnect light cables, keypad and temperature probe connectors.



- 7• Disconnect heater ground cable.



- 6• Disconnect pressure switch cable.



- 8• With wrenches, free the board blades by removing the 2 heater nuts.

How To Replace The Spa Pack

When replacing an SSPA spa pack, it is important to make sure to turn power off before proceeding.



- 9• Slide the pack out of the heater barrel.
- 10• Check if high-limit sensor is properly in place in its slot and slide new pack into position.
- 11• Connect heater to the board blades. It is important to hold both nuts when tightening. If you bend or twist the end of the element, you may damage it.
- 12• Reconnect heater ground cable and pressure switch cables.
- 13• Reconnect light cables, keypad and temperature probe.
- 14• Plug in Pump 1, Pump 2 (or blower) and ozonator connectors.
- 15• Reconnect power input cables.
- 16• Close pack cover.

How To Adjust The Pressure Switch

When a voltmeter is available:

- 1• Set voltmeter to " Ω " (while both probes are touching one another, voltmeter should beep to show there is continuity).

- 2• Turn pump off.

- 3• Do you have continuity on pressure switch?

If you have no continuity, go to step 4.

If you do have continuity, increase pressure switch setting by turning clockwise until voltmeter stops beeping. Then, decrease another 1/4 of turn.

- 4• Turn pump on at low speed and wait a few minutes.

If FLO does not appear, you have adjusted the pressure switch successfully.

If FLO appears, decrease pressure switch setting by turning counter clockwise until voltmeter starts beeping (there is continuity). Then, decrease another 1/4 of turn. Turn pump off.

FLC Should not appear (restart procedure if FLC appears).

- 5• When adjustment procedure is completed, apply Loctite 425 to the adjustment screw to secure it in place.

How To Adjust The Pressure Switch

When a voltmeter is not available:

- 1• Turn pump on at low speed.
- 2• Increase the pressure switch setting to 4 P.S.I. or until FLO message is displayed.
- 3• Start decreasing pressure switch setting by very slowly turning adjustment screw counter clockwise until FLO message disappears. Then, decrease another 1/4 of turn.
- 4• Turn pump on at high speed for 30 seconds; there should be no FLO message.
- 5• Turn pump off and wait 30 seconds. You should not see an FLC message.
- 6• Turn pump to low speed for 30 seconds. You should not see an FLO message.
- 7• If you see an FLO or an FLC message, restart the adjustment procedure.

If you are not able to adjust the pressure switch, change it.

- 8• When adjustment procedure is completed, apply Loctite 425 to the adjustment screw to secure it in place.



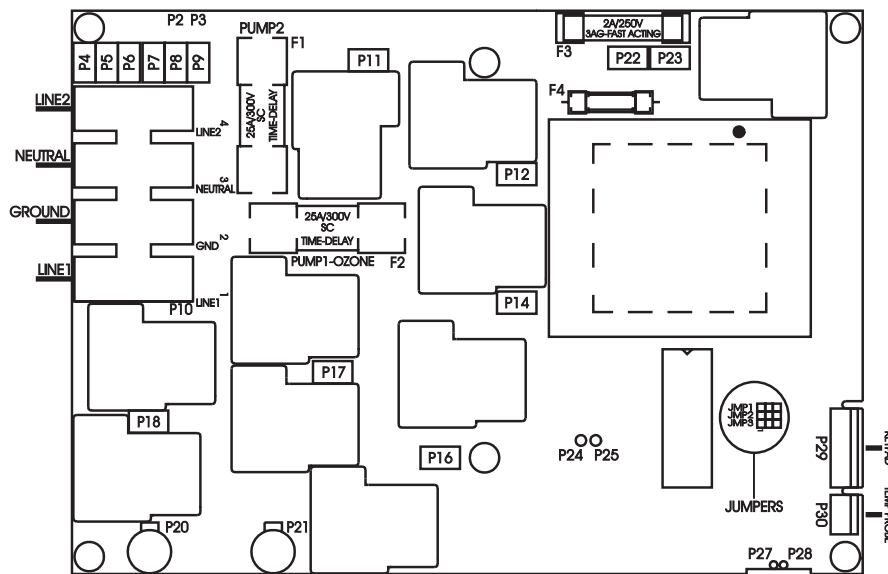
Parts List

*We recommend that field service technicians keep the items identified with an * in stock.*

Ref.:	Part Number	Description	Retail U.S.	CDN
1	530AB0061	Tail piece for 2" heater	5.39	7.33
1	530AB0042-P5	Gasket for 2" tail piece (package of 5)	8.00	10.88
2	282CA0071	Nut for 2" heater	4.90	6.67 *
4	9920-400178	Light cords (option LS)	7.57	10.3 *
6	9920-400200	J&J mini connector for pump 1	7.26	9.88
6	9920-400199	J&J mini connector for pump 2, single speed	6.68	9.09
6	9920-400200	J&J mini connector for pump 2, two speeds	7.26	9.88
6	9920-400204	J&J mini connector for ozone	5.92	8.06
6	9920-400203	J&J mini connector for blower	5.92	8.06
6	9920-400205	J&J mini connector for circulation pump	5.92	8.06
6	9920-400277	AMP connector for pump 1	7.26	9.88
6	9920-400276	AMP connector for pump 2, single speed	6.68	9.09
6	9920-400277	AMP connector for pump 2, two speeds	7.26	9.88
6	9920-400278	AMP connector for ozone	6.68	9.09
6	9920-400278	AMP connector for blower	6.68	9.09
6	9920-400276	AMP connector for circulation pump	6.68	9.09
12	530AA0107	In-line 5.5Kw heater	143.17	194.79
12	530AB0087	5.5Kw 240V element for in-line heater	88.20	119.99 *
13	510AD0064	Pressure switch	28.42	38.67 *
19	282AD0038-P25	Ground screws (package of 25)	9.86	13.42
22	430AC0103-P10	Fuses for light (package of 10)	11.14	15.15 *
23	430AE0033-P10	Fuses for pumps (package of 10)	56.57	76.97 *
29	430AD0066-P10	Fuses for transformer	11.14	15.15
30	9920-400262	10-foot temperature probe	19.20	26.12 *

Wiring Diagram (SSPA-1)

The wiring diagram below provides a general idea of SSPA-1 wiring, but it is important to note that it may not apply to all systems. The wiring diagram including on inside power box cover is the one to be used as main reference for the spa you are servicing.



Pump 1	
Voltage	240v
Green / Ground	P4
Black / Low Speed	P14
Red / High Speed	P12
White / Com	P18

Ozonator	
Voltage	120v
Green / Ground	P5
Black / Line	P16
White / Neutral	P8

Heater	
Black 1	P20
Black 2	P21

Pump 2	
Voltage	240v
Green / Ground	P6
Black / Line	P11
White / Com	P17

Light Connector	
White / 0 VAC	P23
Black / 12 VAC	P22

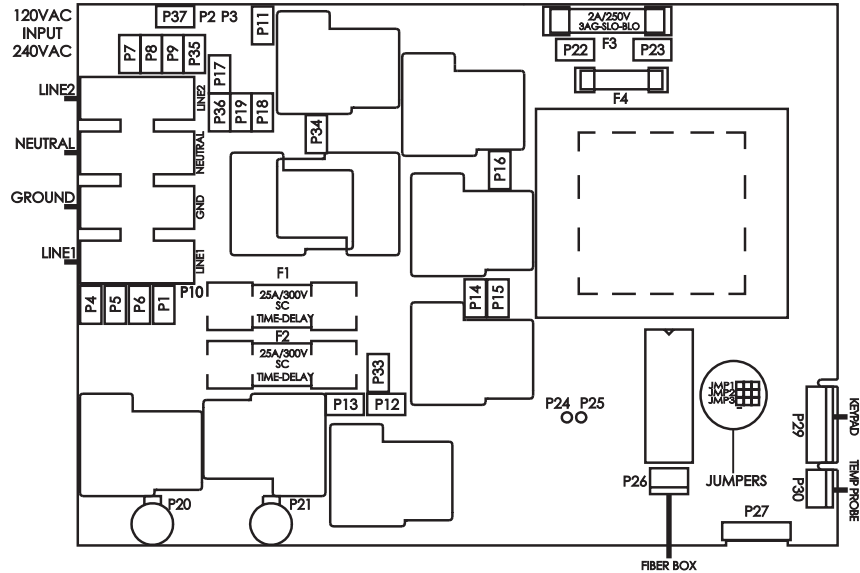
Pressure Switch	
Green	P25
Red	P24

Jumper Settings

Refer to page 10

Wiring Diagram (SSPA-MP)

The wiring diagram below provides a general idea of SSPA-MP wiring, but it is important to note that it may not apply to all systems. The wiring diagram including on inside power box cover is the one to be used as main reference for the spa you are servicing.



Pump 1

Voltage	120v	240v
Green / Ground	P4	P4
Black / Low Speed	P14	P14
Red / High Speed	P12	P12
White / Com	P7	P18

Ozonator

Voltage	120v	240v
Green / Ground	P5	P5
Black / Line	P16	P16
White / Com	P8	P19

Light Connector

White / Light	P23
Black / 12 VAC	P22

Pump 2

Voltage	120v	240v
Green / Ground	P6	P6
Black / Line	P11	P11
White / Com	P9	P17

Blower

Voltage	120v	240v
Green / Ground	P37	P37
Black / Line	P34	P34
White / Com	P35	P36

Heater

Black 1	P20
Black 2	P21

Jumper Settings

Refer to page 10

Fiber Box

Voltage	120v
Green / Ground	P1
Black / Line	P33
White / Neutral	P35

Pressure Switch

Green	P24
Red	P25



Professional Repair Kit

All you need in one case!



Gecko's professional repair kit contains all you need to service and repair Gecko's line of power spa packs.

- Top side controls (keypads)
- Temperature probes
- Pressure switch cables
- Flow switches
- Elements
- Heater wires
- Transformer
- Ground lugs
- Grommets
- Standoffs
- Light cords
- Strain reliefs for light cord
- Plugs
- Fuse kits
- Screws



Call 1.800.78.GECKO
to order or for more info!

SSPA SERVICE MANUAL



COMPLETE SERVICE GUIDE WITH
STEP-BY-STEP INSTRUCTIONS ON:

GFCI Troubleshooting

•

Jumper Setup

•

Understanding
& Correcting
Error Messages

•

System Malfunctions

•

Part Replacement
Procedure

•

& More



A Handy-Dandy Guide to Heaters

with
Information on the Causes &
Corrections of the Bad Things That Can
Happen



Mechanical Failures



Brand New Element

The term "Mechanical Failure" covers everything from shipping damage to dog bite, but the most common mechanical failures in electric heaters are caused by improper handling - destroying the Epoxy End Seal, and breaking or twisting the Cold Pin until it breaks are the two leaders in this failure mode. Because they are so closely related we'll look at them together.

WHAT HAPPENS?

Any form of rough handling can put pressure on the part of the heater that sticks out the most - the Electrical Terminal, which is welded to the Cold Pin, which in turn passes through the Epoxy End Seal to get to the Heating Coil inside of the element. If the Electrical Terminal is broken away from the Cold Pin there is obviously no way to connect electrical wires to the heater, and it becomes a throwaway.

More often the rough handling results in the destruction of the Epoxy End Seal. This will allow moisture to get into the inside of the



BROKEN EPOXY SEAL

element where it will be absorbed by the MGO Filler and will eventually cause an electrical short circuit between either the electrically "hot" Cold Pin or Heating Coil, and the electrically grounded Outer Sheath of the heater. With luck, there will be a GFCI on the system that will open the circuit.

If you don't know what caused the GFCI to turn the power off, you might start investigating "nuisance tripping".

Without the GFCI there will eventually be arcs, sparks, flames and anger - you can bet on that.

HOW CAN THIS BE PREVENTED?



BAD COLD PIN WELD



TWISTED COLD PIN

Moisture may get inside of the element when it is off. Part of the cooling off process is to suck in any surrounding air through *any* crack. Then, the next time the element is energized, the moisture in the element may provide a path for current to flow, and the GFCI will trip. But, a BIG BUT - the heater may have been on just long enough to produce enough heat to drive that moisture out of there. You come along and reset the GFCI - and the heater will come back on again. Drive ya nutty, as they say. Check that Cold Seal carefully.

A Sidebar

When we talk about "Mechanical" failure we must remember that heaters have no moving parts. There is nothing to "wear out". There are no parts that spin, turn, jerk, or slide, and no gears to mesh, or hinges to squeak. All of the mechanical failures we can name are caused by *people* doing things they shouldn't do, or neglecting to do the things that they should do.

Never bend, push, pull or twist the Electrical Terminal 1 **Always** use **two** wrenches to tighten or loosen the Terminal Nut 2 . One wrench holding the Terminal Hex 4 to keep it from turning, and one on the Terminal Nut to do the tightening or loosening.

The trick to analyzing this failure is to carefully examine the Cold Seal. Signs of severe fracture or chipping are an almost sure bet that the Cold Seal is no longer able to do its job - to seal. If the heater has been acting strange - erratic - sometimes working fine and other times tripping the GFCI: look at that Cold Seal.

THE NOISY HEATERS – HUMS, VIBRATIONS, SQUEALS, TWITTERS, SHREKS, SCREAMS, RATTLES, WHISTLES, TWEETS, & CHIRPS

Rarely, maybe never, is the element itself at fault when noise is reported in a heater, even though it is the element that is usually making the noise. The huge amount of water moving rapidly past the element can set up some wild vibration patterns as it twists and turns through the heater. Usually it is simply a matter of re-aligning the element by a bit of gentle bending to move it away from the heater housing; or tying the noisy part down with a clip or wire made for the purpose. Check with us.

Dry Fire – The Ultimate Element Destroyer

SETTING THE STAGE



**SHEATH BURNED-
OUT DUE TO DRY
FIRE**



**DISCOLORED
HEATER TUBE
DUE TO DRY FIRE**

In normal operation the heaters that we deal with daily in pools and spa operate at temperatures only a few degrees above the temperature of the water that is flowing past them. If the thermostat in a spa is set to maintain the water at 102°, for example, the temperature of the Incoloy Outer Sheath will be about 110°. The water flowing past the element is carrying the heat away just about as fast as the element can produce it. Everyone is happy.

WHAT GOES WRONG?

One of three things can happen - A) the water flow slows down too much, B) the water flow stops, or C) the heater is somehow turned on with either no water in the housing, or only partially filled. The results will be the same: the Incoloy Outer Sheath temperature will rapidly rise - 200° - 500° - 1,000° - 1,500° in a matter of just a minute or two. The melting point of the Sheath is 1700° to 1800° F, and it will get there quickly unless it isn't turned off by some safety device like a high-limit switch. The failure can show up in several different ways:

- ✓ *The Outer Sheath splits open. The Heating Coil wire is hanging out in all directions and the MGO Filler is cracked, smashed and blown away. The element is totally destroyed, and frequently the Stainless Steel Heater Housing may be damaged as well.*

- ✓ *Just one or two small holes are blown through the Sheath - not as dramatic as a complete, explosive meltdown, but just as costly. The element is destroyed.*
- ✓ *No holes are visible, but the walls of the Sheath are bulged outward in spots, the normally smooth surface of the Sheath is now bumpy and has become discolored. Inside of the element the Heating Coil may be broken; or it might be electrically shorted against the Sheath. Or both.*

WHY? WHY? WHY?



MELTED PRESSURE
SWITCH

That's three good questions. Lets take a look at a few of the things we have learned from a lot of field experience plus a ton of hours in the engineering lab:

HIGH LIMIT PROTECTION – the primary job of the High Limit Switch in the finished product is to prevent scalding water from ever reaching the people using the product. Sure, the Thermostat should shut the heater off long before the point at which the High Limit Switch is needed, but Thermostats, like everything else, fail.

Will the High Limit do its job? It hasn't had to operate for months or years – is it ready? Is it in the right place to do the job? If the High Limit is not sensing the water temperature close to the element, and the pump suddenly quits – its dry fire time in just a minute or two. The element will boil the water in the heater housing – and create its own “dry” condition.

Following that, the service technician arrives and finds the heater assembly full of water again, and claims it couldn't have been a dry fire. Check that High Limit.

FLO/PRESSURE SWITCHES – Various types of devices are used to detect whether there is any water flowing through the heater assembly. Unfortunately, when these things fail, they generally fail in the closed position and there is no indication that they are not doing their job. In most cases a spa system will work just fine with a stuck pressure or flow switch – until there is a need for it.

If a full-scale dry-fire destroys the flow or pressure switch along with the element, it's impossible to determine which went first; but one thing is certain – the heater was doing its job. It isn't very smart – it just makes heat.

Attack of the Killer Chemicals

CORROSION – the Bad Guy

It's a mean, angry sounding word, bringing visions of all sorts of nasty things. Even the dictionary makes it sound pretty evil "...akin to RODENT" no less. Come to think of it, we've seen a few heaters that looked like rats had been gnawing on 'em.

cor . rode (kă rod') v.
1. to eat or wear away gradually as if by gnawing, esp. by chemical action
ME (<MF) <L corrodere to gnaw; akin to RODENT

We think it's a safe bet to say that one of the major causes of heater failure has always been corrosion. Given any chance at all, this demon will destroy a heater element or, in many cases, the entire heater.

The corrosion we come across in our industry, particularly in spa equipment, comes in many varieties, each with its own name and characteristics - we are faced with galvanic corrosion, chemical pitting, intergranular corrosion, stress corrosion cracking, corrosion fatigue, electrochemical corrosion - we even have a strain of bacteria: *Ferrobacillus* in the *Siderocapsaceae* family, also called "iron eating bacteria," to contend with. Gee Whiz.

WHAT CAUSES ALL THIS?

Well, a full discussion of the chemistry and electrochemistry involved with this pretty complex subject is beyond the intent of this Handy-Dandy Guide. It's much easier to describe what *doesn't* cause it than to attempt to explain all the chemistry that does. Consider this: if all those spas out there were filled with clean, pure water, and no one ever added any chemicals to them, the word

corrosion would soon leave our vocabulary.

Unfortunately, that's not going to happen, and all those spas are going to continue being filled with water of every type, from the Cascade Mountain's rain water to big-city sludge.

A DEADLY SOUP

Then, to add to the problem, we have learned that many, many spa owners are *not* following all of the instructions they've been given about pH, Total Alkalinity, Calcium Hardness and Total Dissolved Solids; or about how to handle those unique water problems that may exist in *their* spa when it is filled with water from *their* tap.



BULKHEAD CORROSION



BAD CORROSION ON
ELEMENT



ZIPPERED ELEMENT



EXTREME
CALCIFICATION

LOW pH – BOO! HISS!

If we had to pick the worst offender in the corrosion list, it would definitely be LOW pH, because, as we all learned long ago: when a test sample of

the water shows a LOW pH (below 7.0), it indicates the water is ACIDIC. Remember now, this is not just saying that there is ACID in the water - it says that the water has become an ACID. It doesn't matter at all what kind of ACID caused this to happen - hypochlorous, hydrochloric, hypobromous, muriatic or whatever - when the water becomes an ACID it becomes a starving, hungry, corrosive beast looking for lunch. ACIDS will corrode – eat away – almost any metal in their path in order to satisfy that hunger.

An element or heater corroded because the water has a LOW pH is easy to spot – it has pieces eaten away from its surface. Gone, disappeared, departed. It looks like the craters of the moon. And people are putting their bodies in there!

SCALE/CALIFICATION – HISS! BOO!

At the other end of the ---- we have SCALE. In some ways SCALE can be considered as the opposite of ACID: with SCALE the water has too much of something and wants to get rid of it, and the nice warm heating element is a good place to deposit it, The problem is that it's like asking a Hawaiian to run a marathon in Honolulu dressed in a fur coat, wool cap and mukluks. He's going to have a rough time getting rid of the heat he's generating, and probably won't finish the race.

MORE UGLINESS

Bad-chemistry corrosion can show up where the element sheath is brazed to the bulkhead fitting, or welded to a mounting plate. Even though all of the parts are “stainless” steel, and selected just for this purpose, the ingredients (mostly iron, chromium, nickel and molybdenum) in the steel must vary – the mix has to be different for parts like the Bulkhead Fitting that needs to be machined, versus the thin, high temperature Incoloy Outer Sheath that must be bent and formed.



**RUST BUILD-UP ON
ELEMENT**



BACTERIA RESULT

Very special welding techniques are used at these joints to make sure that no impurities are left behind that might corrode. But, if the water gets bad enough, you may see anywhere from a rust-like deposit to crack and fissures in the metal.

At its worst it can result in “corrosion fatigue”, causing the Bulkhead Fitting to breakaway from the Outer Sheath. This corrosion is bad stuff.

AND THEN: THERE'S THE IRON EATER

A slippery, brownish coating on the inside wall of a spa may not be any form of algae, but can be the effects of an “iron eating bacteria” that is gnawing away at the heater. This one is easy to correct – the water simply needs some sanitizer: chlorine, bromine or ozone here, a drain and refill if it won't go away.

WHAT'S THE BOTTOM LINE ON CORROSION?

Corrosion of the metal in a pool or spa heater happens when the water becomes corrosive because somebody makes mistakes with its chemistry.

There are more than 2,000,000 spas in the USA alone that have never shown any signs of corrosion – some more than twenty years old.

Their owners follow the instructions of the professionals at their local pool/spa store, and maintain a good sanitizer level along with a non-corrosive pH level, and monitor their Total Alkalinity, Calcium Hardness and Total Dissolved Solids for a good water balance. They do not “Throw in a little of this or a little of that.” That’s like signing a Pledge Of Corrosion.

Electrical Failures

DO THEY EVER JUST “BURN OUT”?

It's correct to say that the only "natural" - like in "died of natural causes," - electrical failure that a resistance-wire heater ever suffers is when the Heating Coil breaks, causing an OPEN in the circuit. This is also the only electrical failure ever covered by our warranty.

It's exactly the same as a light bulb burning out - it just gets tired of the tremendous trauma it goes through each time the power is applied. Picture it - it goes from cold to very, very hot in less than 1/10th of a second - it opens its door to see who's knocking and a thousand billion billion electrons (that's 21 zeros!) rush in during the first second.

Because of the careful selection of components in the Heating Coil, this sort of failure is actually quite rare. (You will rarely see a light bulb burn out *while* it was on? Probably never - they always burn out just as you *turn them on*. That's "turn-on trauma") However, it can be brought on more quickly by switching the heater on and off rapidly - this can happen with a defective control, such as a chattering contactor or thermostat, for example. Be very suspicious if a replacement heater burns out quickly. Watch for this.

Another suspect in an OPEN situation is a reduced water flow that causes the element to operate at a much higher temperature than normal, but not high enough to cause a dry-fire condition. There may be no signs of the problem on the outside of the element - it just got tired of working too hard.

A Special Note To Our Manufacturer and Assembler Customers:

Please remember that both Aquatemp and the original manufacturer of the heater element have run the required Dielectric Voltage Withstand Test ("Hi Pot Test") on every unit we build. Both of us are very careful to keep the test time to the absolute minimum allowed to prevent any degradation of the dielectric material within the element.

everything You always wanted to know about testing of the electric part of electric heaters



TYPICAL TEST
METER

Of any piece of equipment you might find on a spa or tub today, the electric heater is probably the most simple - we're not talking here about the controls, now - just the heater itself. What makes it simple is that it is a straight *resistive* device. It doesn't have any coils like motors and transformers, giving them *inductive* characteristics; and it isn't anything at all like a solid state, printed circuit board mounted, micro-processor based control system. With heaters, the electrical is plain-Jane.

THE IMPORTANT NUMBERS

You can learn just about all there is to know about an electric heater by applying a little knowledge and a smidgen of easy math, along with a decent test meter. We'll start with the basic numbers:

● These first two numbers are stamped or marked on the heater .

Rated Voltage, like:
115, 120, 240, or 230 volts

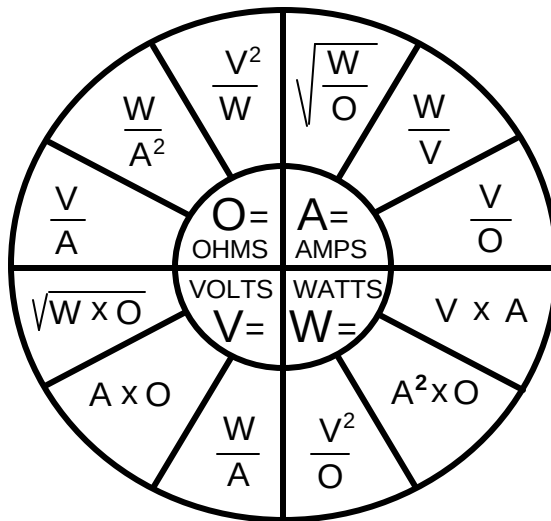
Rated Wattage, like:
1500, 5500 watts or

● These next two are calculated using the above numbers:

Calculated Amperage, like:
12.5, 22.9, 25, or 48 amps

Calculated Ohms, like:
5.0, 9.6, or 10.5 ohms

The math part is kept simple by using our Handy-Dandy Decoder Ring, shown at right. Let's say you want to figure the amps rating of a heater marked 240 volts & 5500 watts. Use W/V that would be 5500 divided by 240, and the answer is 22.9 amps. Simple.



● The next three are measured with a meter at an operating heater:

Measured Voltage, like: 112, 227, or 238 volts
Measured Amps, like: 11.5, 21, 24.6, or 44 amps

Measured Ohms, like:

USING THE NUMBERS



USING TEST METER

All that follows applies to all electrical heaters. The task is simple – to determine if the heater is producing heat (watts); and then make sure that it is safe – these are the facts, ma'am.

First, measure and compare the voltage at the heater terminals with the voltage at the panel board, receptacle or other power source. Don't blame the heater for poor performance if this Measured Voltage is more than 10% below the heater's Rated Voltage. (Do the math V^2/O , to see how quickly the watts drop as the volts drop.)

☉ If the Measured Voltage was much different than the Rated Voltage, you'll have to re-figure the Calculated Amps using V/O . (You can't use W/V because you're not sure what the wattage is anymore.) Then, with power still on, put your clamp-on ammeter around ONE of the heater wires – either one, but only one. You're now reading Measured Amps, which should match the Calculated Amps number, within 10%.

☉ Turn OFF all power, then DISCONNECT BOTH WIRES from the heater terminals. Set the meter to the OHM;s scale and take the following readings at the element terminals:

Terminal – to terminal: the Measured Ohms should read within 10% of Calculated Ohms.

From each terminal, one at a time, to the element sheath or element mounting plate: should read OPEN or INFINITY. ANY OTHER READING says the element is internally shorted. This is a bad element. Look for signs of dry fire damage.

That's it. You now know all there is to know about the electric stuff in the heater. You can now re-calculate the wattage using the voltage, amps and ohms numbers you have measured, confident in your knowledge.

The Meter Sidebar

A good test meter is a must if we are to learn what's going on in the electric heart of that heater. Take full advantage of today's technology and check out the latest units that combine the digital volt/ohm meter with a clamp-on ammeter. It's like they knew about electric heaters when they designed these guys. Check out B&K Precision's 330 & 340; A.W. Sperry's DSA-2007, and others by Radio Shack, Fluke and Scope. All are available in the \$80 - \$100 range.